CLAIMS:

1. A retroreflective device comprising:

a lens having a non-planar outer surface; and

a liquid crystal cell having a non-planar layer comprising liquid crystal material, said non-planar layer having a shape related to that of the non-planar outer surface of the lens,

wherein the device includes a reflective part arranged to retroreflect a radiation beam passing through the lens, and the liquid crystal cell is arranged to modulate one or more characteristics of said retroreflected radiation beam.

2. A retroreflective device according to claim 1, wherein the liquid crystal cell comprises a metallic layer

that serves both as an electrode and said reflective part.

3. A retroreflective device according to claim 2, the liquid crystal cell including an alignment layer located between the liquid crystal layer and the metallic layer.

4. A retroreflective device according to claim 2 or claim 3, wherein the metallic layer comprises aluminium.

5. A retroreflective device according to any one of the preceding claims, wherein the liquid crystal cell comprises a transparent electrode layer located between said lens and said liquid crystal material.

6. A retroreflective device according to any one of the preceding claims, wherein the liquid crystal layer include spacers arranged so as to ensure that the liquid crystal layer conforms to a substantially constant thickness.

7. A retroreflective device according to claim 6, wherein the spacers comprise any one of rods, fibres or balls.

8. A retroreflective device according to any one of the preceding claims, wherein the liquid crystal material is ferroelectric.

9. A retroreflective device according to any one of the preceding claims, wherein the liquid crystal cell is attached to said non-planar outer surface.

10. A retroreflective device according to any of claims 1 to 8, wherein the liquid crystal cell is spaced from said non-planar outer surface.

11. A retroreflective device according to claim 10, wherein a transparent window having a shape related to that of the non-planar outer surface of the lens is located between the liquid crystal cell and said lens.

12. A retroreflective device according to claim 11, wherein the transparent electrode layer is supported by said window.

13. A retroreflective device according to any one of claims 3 to 12 when dependent on claim 2, including an electrical source arranged to apply electrical signals to the electrode layer and to the metallic layer, thereby changing an optical characteristic of the radiation beam passing through the lens.

14. A retroreflective device according to any one of the preceding claims, wherein the lens has a spherical outer surface.

15. A device according to any one of the preceding claims, wherein the lens comprises a graded refractive index lens.

16. A method of manufacturing a retroreflective device according to any one of the preceding claims, including:

fabricating a base for the retroreflective device, the base including a non-planar surface for supporting the non-planar layer of liquid crystal material;

locating the lens with respect to the non-planar surface of the base; and

inserting a layer of liquid crystal material between said lens and non-planar surface of the base.

17. A method of manufacturing a retroreflective device according to claim 16, wherein the step of fabricating the base includes

selecting a non-planar device;

inserting the selected non-planar device into a bath comprising a viscous material such that a portion of the non-planar device extends outwards of the viscous material;

applying a spacer layer to the outwardly extending portion of the non-planar device; and

covering the spacer layer with a curable resin.

18. A method according to claim 16, in which the step of selecting a non-planar device includes selecting a non-planar device that is substantially identical to the non-planar lens forming part of the retroreflective device.

19. A method according to claim 17 or claim 18, including applying the spacer layer by means of a sputtering technique.

20. A method according to any one of claim 17 to claim 19, including applying a mould release layer between said spacer layer and said resin.

21. A method according to any one of claims 17 to 20, including, after a predetermined curing time has elapsed, removing the cured resin from the spacer layer, said cured resin providing said base.

22. A method according to any one of claim 16 to claim 21, including applying a metallised electrode layer to the base.

23. A method according to any one of claim 16 to claim 22, including applying an alignment layer to the base by means of a sputtering technique.

24. A method according to claim 23, including imprinting a plurality of molecular-scale ridges into the alignment layer.

25. A method according to claim 23 or claim 24, including applying a plurality of spacing devices to the alignment layer.

26. A method according to claim 25, including applying the spacing devices under control of a pressurized gas flow.

27. A method according to any one of claim 16 to claim 26, including applying a transparent electrode layer to a surface of said lens.

28. A method according to any one of claims 16 to 26, including selecting a transparent window having a shape related to that of the non-planar lens forming part of the retroreflective device and applying a transparent electrode layer to a surface of said window.

29. A method according to claim 28, including locating the window onto the spacing devices, so that the surface supporting the transparent electrode layer is adjacent to said spacers.

30. A method according to claim 29, wherein the step of locating the lens with respect to the non-planar surface of the base includes locating the lens in relation to the window so that a gap exists between the liquid crystal cell and the lens.

31. A method according to any one of claim 16 to claim 30, in which the step of inserting a layer of liquid crystal material includes:

heating a volume of liquid crystal material; and

inserting the device into the heated volume under vacuum conditions so as to effect migration of said heated liquid crystal material into the liquid crystal cell.

32. A method according to claim 31, including creating a seal between the base and the lens.

33. A retroreflective system including at least one retroreflective device according to any of claim 1 to claim 15 and means configured to transmit data to a source of radiation incident upon the device by controlled application of said modulation.

34. A system according to claim 33 wherein said data is transmitted over a free space communications link.

35. A system according to claim 33 or claim 34 wherein the retroreflective device is arranged to emit signals in response to application of said modulation, the system including a phase modulation detector arranged to receive said emitted signals.

36. A retroreflecting device comprising

a lens having an outer surface; and

a liquid crystal cell having a layer comprising liquid crystal material,

wherein the device includes a part arranged both to retroreflect a radiation beam passing through the lens and to function as an electrode of the liquid crystal cell.